# Summary

Standard implant-prosthetic treatment is a multistep treatment and consists in implantation, uncovering of the healing screw, making impressions and insertion of the abutment and prosthetic crown. This procedure requires several times the unscrewing of the healing screw, which results in the loss of connection between the healing screw and the surrounding soft tissues and consequently may lead to the creation of a pocket around the implant. The introduction of new digital technologies gave the possibility of making a abutment before the implant was exposed and its assembly without taking the step of the healing screw and impressions from the implant level. The insertion of the abutment immediately after the implant is exposed and the need for its subsequent unscrewing allows for a permanent connection between the gingival hemidesmosomes and the surface of the abutment. The creation of a permanent connection between the gingiva - the abutment also creates a more favorable soft tissue architecture, which creates a sulcus, not a pocket around the implant. The creation of this type of structure seems more desirable from a biological point of view as a structure that constitutes a better barrier against bacterial infection and the potential development of peri-implantitis.

Bearing in mind the above, the aim of the study was an assessment of the tissues around implants after applying the classic prosthetic protocol with the use of healing screw and the protocol omitting the healing screw stage.

This goal was decided based on:

- analysis of the clinical status of soft tissues surrounding the implants immediately after the prosthetic crowns delivery and 1, 3, 6 and 12 months after the completion of treatment

- radiographic assessment of the bone around the implants at the uncovering stage and after the completion of treatment.

The study group consisted of 135 people aged 18 to 82 (including 64 women and 71 men). Depending on the treatment used, patients were divided into two subgroups:

- Group 0 (control) - 68 people who received a classic implant prosthesis procedure, with a healing screw and a standard titanium abutment

- Group 1 (test) - 67 people in whom implant-prosthetic treatment took place without the healing screw step being taken, and the abutment used was an individual hybrid.

The clinical examination was performed in strictly defined time intervals, i.e. immediately after the prosthetic reconstruction and 1, 3, 6 and 12 months after the completion of the treatment. The clinical examination consisted in the evaluation of the following parameters:

- approximal plaque index (API) (%) according to Lange

- bleeding on probing (BOP) according to Ainamo and Bay (%) in 4 measurement points

- probing depth (PD) (in mm) in 4 measurement points

- the width of the keratinized gingiva (double examination – after crown delivery and 12 months later).

Radiographic examination was performed twice using cone beam computed tomography (CBCT) - immediately before the implant uncovering and 1 year after the completion of the treatment.

CBCT scans were examined to assess:

- bone crest position in relation to the implant collar at 2 measuring points

- the thickness of the vestibular and palatal/lingual bone plate in 2 measuring points. The obtained results were subjected to statistical analysis.

Mean values of API and BOP before and after treatment did not differ significantly between groups. In the control group, the average probing depth (PD) after crown delivery was 1.22±0.39mm, while in the test group - 1.29±0.38mm. After 12 months, PD significantly decreased in both groups to 1.1±0.64mm and 0.5±0.43mm, respectively (p=0.000). There was a significant difference in mean PD values after treatment between groups (p=0.000).

The width of the keratinized gingiva (KT) in the first examination was slightly greater in the group 0, but this difference was not significant. After treatment, the KT value increased in both groups, however neither changes in time nor differences between groups after treatment were statistically significant.

Immediately prior to uncovering of the implants, the buccal bone margin (RTG Vp) was distant by an average of 0.02±0.06mm in relation to the implant collar in the control group and by 0.09±0.22mm in the test group, which gave a statistically significant difference (p=0.01). After treatment, these values increased significantly in both groups up to 0.08±0.14mm and 0.14± 0.31mm, but the difference between the groups was statistically insignificant. Changes in time, however, turned out to be statistically significant.

On the lingual side, the mean distance of the bone margin from the implant collar (RTG Vj) was 0.01±0.05mm in the control group and 0.03±0.12mm in the test group, but this difference was not statistically significant. After the completion of treatment, these values ​​increased to 0.04±0.08mm in the control group and 0.06±0.15mm in the study group. Changes in time in both groups were statistically significant (p=0.000), while the difference between groups after treatment was not significant.

Before uncovering of the implants, the thickness on the buccal plate (RTG Hp) was comparable in both groups and was on average 1.76±0.46mm in the control group and 1.70±0.68mm in the test group. After treatment, these values ​​remained unchanged (1.78±0.50mm in the control group, 1.70±0.69mm in the study group).

On the lingual side, the mean bone thickness (RTG Hj) was 1.71±0.47mm in the control group and 1.96±0.36mm in the test group. The difference was statistically significant. After completion of treatment, these values ​​were 1.69±0.46mm in the control group and 1.99±0.35mm in the test group, giving a significant difference between the groups. Changes in time in the control group were statistically insignificant (p=0.06) and significant in the test group (p=0.000).

The analysis of clinical parameters in the whole group of patients (total control and test group), depending on the number of cigarettes smoked, showed significantly lower values ​​of API, BOP and PD, and wider keratinized gingiva in the post-treatment examination. In the analysis of radiographic parameters, a significantly smaller distance between the margin of the bone crest on the buccal and lingual/palatal side and the collar of the implant was noted in people smoking less cigarettes.

In the control group, it was found that after completion of treatment API and BOP were significantly lower in smokers with less than 10 cigarettes a day. In the CBCT examination, significantly smaller distance of the bone crest from the collar of the implant on the buccal side was found. In the test group after the treatment API, BOP and PD were significantly lower, and KT significantly wider in smokers with less than 10 cigarettes a day. CBCT revealed a significantly smaller distance between the implant collar and the bone crest on the lingual side of the implant.

Analysis of clinical and radiographic parameters in the entire examined group of patients (total control and test group) depending on the width of the keratinized gingiva revealed that in people whose implants are surrounded by narrower than 2mm keratinized tissue, API and PD after treatment were significantly higher in comparison to a group of people with a wider than 2mm keratinized gingiva. In the CBCT, the distance between the collar of the implant and the bone crest on the buccal and lingual side was significantly higher, and the width of the buccal plate significantly thinner in the group of people with narrower keratinized gingiva.

In the control group, it was found that after completion of treatment API and PD were significantly lower in people with keratinized tissue wider than 2mm. In the test group, it was shown that after treatment API and PD were significantly lower in people with wider than 2mm keratinized gingiva. In the CBCT it was noted that the distance between the bone crest and the collar of the implant on the lingual side was significantly smaller, and the width of the buccal plate significantly thicker in people with wider keratinized gingiva.

Based on the results obtained, the following conclusions were drawn:

1. The classic prosthetic protocol with the use of the healing screw and the protocol omitting the healing screw stage allow to achieve satisfactory treatment effects.

2. The clinical and radiographic status of the tissues surrounding the implants does not depend on the type of implant protocol, i.e. the protocol with the use or omission of the healing screw.

3. Smoking over 10 cigarettes per day negatively affects the status of soft tissues and bone surrounding the implants.

4. The width of the keratinized gingiva determines the status of the soft tissues and bone around the dental implants.